

CLAIMS

1. A method of separating, concentrating, or refining a carbon nanotube having a desired physical property from a sample, comprising steps of:
 - a) irradiating light to a sample containing carbon nanotubes and
 - b) selecting the carbon nanotubes having a desired physical property.
2. The method according to claim 1, wherein said physical property includes at least either a diameter or a chiral vector.
3. The method according to claim 1, wherein said carbon nanotube has a single-walled structure.
4. The method according to claim 1, wherein said light has a certain wavelength within a range covering from the near infrared region to the ultraviolet region.
5. The method according to claim 4, wherein said light is monochromatic light or laser light having said wavelength.
6. The method according to claim 1, wherein light irradiation in the step a) is carried out in the presence of metal ions.
7. The method according to claim 6, wherein said metal ions are selected from the group consisting of alkali metals; alkaline earth metals; transition metals

selected from the group consisting of Group IIIA to Group VIIA elements, Group VIII elements, and Group IB elements; and rare earth elements.

8. The method according to claim 1, wherein the step b) is carried out by applying a predetermined magnetic field to said carbon nanotube so as to precipitate the carbon nanotube with the desired physical property.

9. The method according to claim 1, wherein the step b) is carried out by chromatography.

10. The method according to claim 1, wherein said sample further contains a surfactant.

11. The method according to claim 10, wherein said surfactant is selected from the group consisting of sodium dodecyl sulfate, sodium dodecylbenzenesulfonate, Triton X, alkylsulfonates, sodium polyoxyethylene alkyl ether sulfate, benzalconium chloride, alkyltrimethylammonium chloride, benzyltrimethylammonium chloride, nonyl phenol ethoxylate, octyl phenyl polyoxyethylene ether, lauryl polyoxyethylene ether, and cetyl polyoxyethylene ether.

12. The method according to claim 1, wherein said sample is a water-based dispersion or an aqueous solution of the carbon nanotubes.

13. The method according to claim 1, wherein said carbon nanotubes are surface modified with a saturated or unsaturated carbon chain molecule having a carboxyl

group or an amino group as a substituent in the molecule through a covalent bond, an ionic bond, a hydrogen bond, or an intermolecular interaction.

14. The method according to claim 1, wherein said sample is a solution further containing a metal ion and an electron donor.

15. The method according to claim 14, wherein said solution contains the metal ion at a concentration of 0.001 to 10%.

16. The method according to claim 14, wherein said solution contains the electron donor at a concentration of 0.001 to 10%.

17. The method according to claim 14, wherein said electron donor is selected from the group consisting of alcohols, amines, arginine, benzaldehyde, hydrazine, carboxylic acids, amino acids, toluene, alkylbenzenes, terpenes, ethers, silanes, and thiols.

18. A method for analyzing a carbon nanotube having a desired physical property in a sample, comprising the following steps of:

- a) irradiating light to the sample expected to contain the carbon nanotube;
- b) selecting the carbon nanotube having the desired physical property; and
- c) identifying the selected carbon nanotube.

19. The method according claim 18, wherein said physical property includes at least either a diameter or a chiral vector.

20. A carbon nanotube separated by the method according to claim 2, having uniformity in at least either a diameter or a chiral vector.
21. A carbon nanotube composition, obtained by the method according to claim 2, wherein the composition has an increased content of the carbon nanotube having uniformity in at least either a diameter or a chiral vector.
22. A carbon nanotube composition containing a carbon nanotube having uniformity in at least either a diameter or a chiral vector with equal to or greater than 99% purity.
23. A carbon nanotube thin film obtained by adsorbing and fixing the carbon nanotube according to claim 20 on a support.
24. A carbon nanotube array obtained by adsorbing and fixing the carbon nanotube according to claim 20 arranged in predefined patterns on a support.
25. An optical filter comprising the carbon nanotube thin film according to claim 23.
26. An electronic device comprising the carbon nanotube thin film according to claim 23.

27. The electronic device according to claim 26, selected from the group consisting of a conductive thin film, a dielectric thin film, a sensor electrode, an electrode for a high energy density fuel cell, a highly functional display, a single-molecule detection sensor, an acceleration detection sensor, and a magnetic field detection sensor.

28. An apparatus for separating, concentrating, or refining a carbon nanotube having a desired physical property in a sample, comprising:

A) an introduction part for a sample containing the carbon nanotubes;

B) means for irradiating light to the sample; and

C) means for selecting the carbon nanotube having the desired physical property.

29. The apparatus according to claim 28, wherein said physical property includes at least either a diameter or a chiral vector.

30. The apparatus according to claim 28, wherein said means B) is a light source of monochromatic light or laser light having a certain wavelength within a range covering from the near infrared region to the ultraviolet region.

31. The apparatus according to claim 28, wherein said means B) is a polychromatic light source within a range covering from the near infrared region to the ultraviolet region for depositing a metal on the carbon nanotube.

32. The apparatus according to claim 28, wherein said means C) is an electromagnet with controllable magnetism for generating a predetermined magnetic field for depositing the carbon nanotube having the desired physical property.
33. The apparatus according to claim 28, wherein said means C) is chromatography.
34. The apparatus according to claim 28, wherein said sample is a solution further containing a surfactant.
35. The apparatus according to claim 28, wherein said sample is a water-based dispersion or an aqueous solution of the carbon nanotube.
36. The apparatus according to claim 28, wherein said sample is a solution further containing a metal ion and an electron donor.